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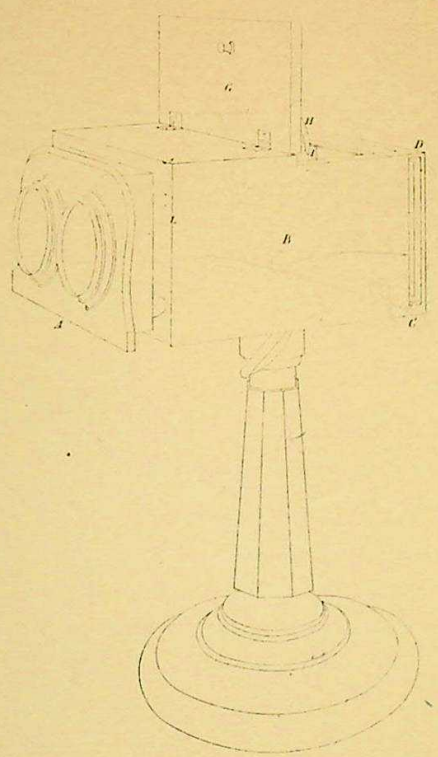
FIG. 1.

Perspective view of the Instrument



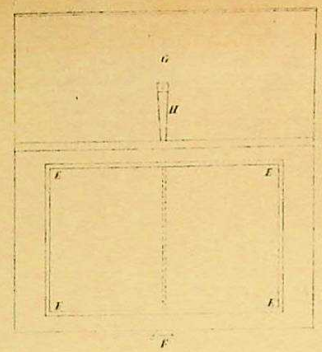


FIG. 3.

View of the Front end of the Instrument with the hat denoted

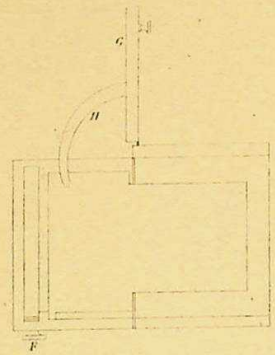


FIG. 4.

Longitudinal Section of the Instrument

Scale one half the original Size

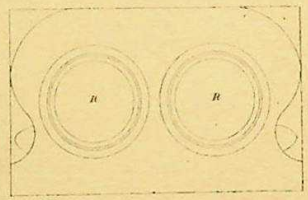
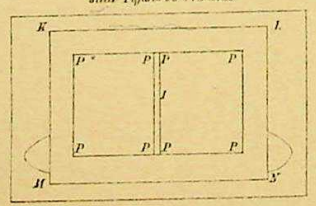


FIG. 5.

Outside View of the eye piece

FIG. 2.

View of the near end of the Instrument with the slide Figures 5 & 6 removed



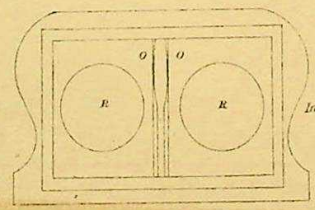


FIG. 6.

Inner View of the eye piece

88. OPTICS,
Stereoscopes.

A.D. 1856 . . . . . N° 2581.

Stereoscopes.

LETTERS PATENT to Ebenezer Erskine Scott, of Dundee, for the Invention of "IMPROVEMENTS IN STEREOSCOPES."

Sealed the 31st March 1857, and dated the 3rd November 1856.

PROVISIONAL SPECIFICATION left by the said Ebenezer Erskine Scott at the Office of the Commissioners of Patents, with his Petition, on the 3rd November 1856.

I, EBENEZER ERSKINE SCOTT, of Dundee, do hereby declare the nature of the Invention for "IMPROVEMENTS IN STEREOSCOPES," to be as follows:—

Heretofore in the construction of refracting stereoscopes it has been usual to employ eye pieces, consisting each of half of a smaller portion of a double convex or other magnifying lens; but in some cases refracting stereoscopes have been constructed having eye pieces consisting of two entire lenses, placed at such a distance apart that the observer looks through the centre of each of them, and the light from the two pictures enters the eyes in parallel rays, as if it radiated from a single object at a great distance from the observer.

Now, my Invention consists in the use of eye pieces composed of two entire lenses placed so that their centres are at a greater distance apart than

the eyes of the observer, the said distance being either fixed or capable of adjustment; the effect being that the light from the pictures passes to the eyes through a portion of each lens more or less within the centre of the same, and appears to radiate from an object placed at a distance from the observer, corresponding with that at which the natural objects represented in the stereoscope pictures have themselves been distant when they were taken. By using entire lenses in this manner the stereoscopic effect is more easily observed than in stereoscopes constructed with portions of lenses, while the spherical and chromatic aberrations are both considerably less than in previous lenticular arrangements, and the combined image retains more completely than in any former arrangement all the natural effects of distance which belonged to the original objects represented.

SPECIFICATION *in pursuance of the conditions of the Letters Patent, filed by the said Ebenezer Erskine Scott in the Great Seal Patent Office on the 28th April 1857.*

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, EBENEZER ERSKINE SCOTT, of Dundee, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Third day of November, in the year of our Lord One thousand eight hundred and fifty-six, in the twentieth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Ebenezer Erskine Scott, Her special licence that I, the said Ebenezer Erskine Scott, my executors, administrators, and assigns, or such others as I, the said Ebenezer Erskine Scott, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN STEREOSCOPES," upon the condition (amongst others) that I, the said Ebenezer Erskine Scott, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

Scott's Improvements in Stereoscopes.

NOW KNOW YE, that I, the said Ebenezer Erskine Scott, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

All previous constructions of the stereoscope refer to one or other of the two constructions about to be mentioned.

First, the stereoscope may be constructed with two separate entire lenses, placed in the instrument at the same distance apart as the eyes of the observer. In this way the optical axes of the eyes are parallel, the right eye being directed in a straight line to the right-hand stereoscopic picture and the left eye to the left picture, and the rays from these objects being thus also parallel, the combined picture is seen in the same way as very distant objects are seen, such as the sun, moon, distant hills, &c.

Second, in the instrument as hitherto commonly constructed the opposite effect is produced, the rays of light from the two pictures being so refracted by the lenticular arrangements adopted that they emerge from the eye pieces, as if they both radiated from a near object as near as the stereoscopic pictures themselves, that is, about six or seven inches distant. This effect is produced by using half or quarter lenses, reversed in their positions, and applied so that the eyes look through the thin outside edges of the glass brought by the reversing to the inside of the double eye piece. Both these modes are objectionable; the first, because few eyes can accustom themselves to look at a near object as if it were very distant; and the second, for the reverse reason, because from the unnecessary extent of refraction the combined pictures are shewn rather as exaggerated miniatures of the real objects, and thus there is wanting the full degree of natural effect, which should, of course, be the object of the stereoscopist to obtain, and the attaining of which in a high degree is the perfection of the instrument. Besides, according to the ordinary lenticular arrangements, the refraction being great the colour is much increased, and spherical distortion converting straight lines into curved lines becomes also much more apparent. In my arrangement I take a medium course, which does away with all the above faults, and has other great advantages. I so arrange the double eye piece that the rays from the two pictures come to the eye as if they radiated from a point of medium distance, such as that at which we are in the habit of looking at natural objects, the effect being, as I have already experienced in numerous cases, that the eyes of the observer instantly form the combined picture without the slightest pain to the eyes, and the reality of the view is consequently much more strongly impressed on the mind,

and the pleasing illusion much increased. The simple way in which this is done is by using entire lenses, and placing their centres a little farther apart than the distance betwixt the eyes of the observer, so that the rays from each picture are slightly refracted outwards. By this arrangement the chromatic fault is reduced to an inappreciable quantity, the spherical distortion very much reduced, and the lenses being each made of considerable diameter, say, $2\frac{1}{2}$ inches, or upwards, it becomes unnecessary to put the eyes close to the instrument, and the whole effect becomes exactly similar in all cases in which the views are correctly taken to that in a well-constructed diorama, the stereoscopic effect being of course added thereto.

The accompanying Drawing represents what I have found to be a very advantageous form of the instrument, having my Invention applied thereto.

Figure 1 is a perspective sketch of the complete instrument. It consists of a box B, the front part of which has ground glass E, E, inlaid therein, as is represented in Figure 3. Immediately behind the ground glass a perpendicular slot C, D, Figure 1, is made in the box, open at the observer's right-hand side, and stretching accross the instrument, so as to allow the stereoscope slides to be placed in the field of view. A small piece of flat brass or other material works to a limited extent sideways in the bottom of this slot by means of the milled head F, represented in Figures 3 and 4, and enables the observer to centre the pictures, which in their position in the slot rest on this piece of brass. The front half of the top of the box opens as a lid G, as is represented in Figures 1 and 3, and the inside of the lid being covered with silver or gold foil serves to reflect light on the pictures in the slot. This lid is retained in any position by a clip of brass H fastened to it, and clipping on to the longitudinal diaphragm I, which stretches along inside of the box, serving to divide it in two, and prevent the observer from seeing more than one of the two views with each eye at a time. This clip H is represented in Figures 1, 3, and 4, and the diaphragm I in Figure 4, in plan. The near end of the box B has an opening in it K, L, M, N, Figure 2, so as to admit the eye piece represented in Figures 5 and 6, and which slides out so as to suit different eye-sights, as represented in Figure 1. From the interior view of the eye piece, Figure 6, it will be observed that it is furnished with a short double diaphragm O, O, so made that in using the instrument a half of this short diaphragm goes on each side of the longitudinal diaphragm I, before described, and serves at all adjustments of the eye piece effectually to keep the two halves of the box separate. The box B is also furnished with a transverse vertical diaphragm, fixed at one-half its length, and having two square apertures therein, P, P, Figure 2, of

sufficient size to enable the observer to see the entire pictures through them and no more. This diaphragm serves to assist in preventing unnecessary light reaching the eye of the observer, and detracting from the clearness of view of the pictures. Finally, in Figures 5 and 6 are represented the sizes and positions of the two lenses R, used to complete the instrument and to adapt it to my Invention. The box is mounted on a turned or ornamented stand, and is capable of adjustment as to height by means of a sliding rod fastened to the box, and a pinching screw, as represented in Figure 1.

In carrying the Invention into practice I have found that the average distance betwixt the centres of the human eyes being about $2\frac{3}{8}$ inches, the most advantageous average distance apart of the lenses constituting the eye piece of the stereoscope is from $2\frac{3}{4}$ inches to $2\frac{7}{16}$ inches, and a very convenient size for each lens is $2\frac{1}{8}$ inches diameter, or when set in their frames, 2 inches aperture, or larger lenses may be employed and cut down eccentrically, so that in their cut down state, although placed at the same distance apart as the eyes of the observer, the original centres are farther apart. At the distance above mentioned the vision of the stereoscopic objects is perfectly distinct for the great majority of individuals; but in exceptional cases, where the eyes are further apart or closer together than the average, an adjustment may be applied to the instrument, by which the distance betwixt the centres of the lenses may in each case be adjusted so as to make the views most distinct and easy of vision to each observer. Further, the lenses themselves may either be constructed of one material or made compound or achromatic, and may be of any of the usual forms, plano-convex, achromatic combinations with the plain surface next to the eyes of the observer having been proved by me to be a highly advantageous construction. I have to add that my Invention is applicable to all practicable sizes of stereoscopic pictures, the distance from the eyes of the observer at which the pictures are placed in the instrument and the relative focus of the lenses being adjusted accordingly.

Having now described the nature of my said Invention, and in what manner the same is to be performed, I, the said Ebenezer Erskine Scott, do hereby declare that I do not claim as new or the exclusive use of any parts of the forms of stereoscopes herein described other than the mode of constructing the eye piece as described by me; but that I do claim as my Invention the use of eye pieces composed of two magnifying lenses, either entire or modified, as already described, placed so that their centres are at a greater distance apart than the eyes of the observer, the said distance being either fixed or capable

of adjustment, so as to produce the maximum of pleasant effect in the use of the instrument.

In witness whereof, I, the said Ebenezer Erskine Scott, have hereto set my hand and seal, this Twenty-fourth day of April, in the year One thousand eight hundred and fifty-seven, before these witnesses, John Sturrock, junior, Writer, Dundee, and Robert Graham Thoms, Apprentice to me, the said Ebenezer Erskine Scott.

E. ERSKINE SCOTT. (L.S.)

JOHN STURROCK, jun., Witness.

R. GRAHAM THOMS, Witness.

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Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1857.